

al *alluvium* (Holocene). Fine to coarse gravelly sand and sandy gravel, silt, and clay, light- to medium-gray and yellowish-gray. Deposited mainly in channel, point-bar, and flood-plain environments; includes sandy deposits of narrow estuarine beaches, and mud, muddy sand, and peat in swamps and in fresh- and brackish-water marshes bordering tidewater rivers. Grades into colluvium along steeper valley walls at margins of unit. Mostly Holocene but, locally, includes low lying Pleistocene (?) terrace deposits. As much as 80 feet thick along major streams.

sb *sand* (Holocene). Pale-gray to light-yellowish gray, fine to coarse, poorly sorted to well-sorted, shelly in part; contains angular to rounded fragments and whole valves of mollusks. Comprises deposits of coastal barrier islands and narrow beach dune ridges bordering brackish-water marshes of Chesapeake Bay. Thickness is as much as 40 feet.

m *marsh and intertidal mud deposits* (Holocene). Medium to dark-gray soft mud, and grayish-brown peat, comprising sediment of marshes in coastal areas and Chesapeake Bay; thickness is 0 to 10 feet. Also, sandy mud and muddy fine sand, light- to dark-gray. Locally, contains abundant shell material characterized by *Crassostrea virginica* and *Mercenaria mercenaria*. Comprises sediments of shallow bays and flats in area of Atlantic coastal lagoons of the Eastern Shore.

Qtlp *Quaternary Lynnhaven and Poquoson Members, undifferentiated*.

Qtl *Quaternary Lynnhaven Member* (Johnson, 1976). Pebbly and cobbly, fine to coarse gray sand grades upward into clayey and silty fine sand and sandy silt; locally, at base of unit, medium to coarse cross-bedded sand and clayey silt containing abundant plant material fill channels cut into underlying stratigraphic units. Unit is surficial deposit of broad swale that is traceable southward from Norfolk; extensive low lands bounded on landward side by river-, bay-, and ocean-facing scarps having toe altitudes of 15 to 18 feet. Thickness is 0 to 20 feet.

Qtp *Quaternary Poquoson Member* (Johnson, 1976). Medium to coarse, pebbly sand grades upward into clayey fine sand and silt, light- to medium-gray; underlies ridge and swale topography (altitude ranges from sea level to 11 feet) along the margin of Chesapeake Bay and in the lower and middle parts of Coastal Plain rivers. Thickness is 0 to 15 feet.

Qts *Quaternary Sedgefield Member* (Johnson, 1976). Pebbly to bouldery, clayey sand and fine to medium, shelly sand that grades upward into sandy and clayey silt; locally channel fill at base of unit includes as much as 50 feet of fine to coarse, cross-bedded sand and clayey silt and peat containing in-situ tree stumps. Sandy bay facies commonly contains *Crassostrea biostrames*, *Mercenaria*, *Anadara*, *Polynices*, *Ensis*, and other mollusks. Specimens of the coral *Astrangia* have yielded estimated uranium-series ages averaging $71,000 \pm 7,000$ yrs B.P. (Mixon and others, 1982). Unit constitutes surficial deposit to river and coast-parallel plains (altitude 20-30 feet) bounded on landward side by Suffolk and Harpersville scarps. Thickness is 0 to 50 feet.

Qsh *Quaternary Shirley Formation* (middle Pleistocene, Johnson and Berquist, 1989). Light- to dark-gray, bluish-gray and brown sand, gravel, silt, clay, and peat. Constitutes surficial deposits of riverine terraces and relict baymouth barriers and bay-floor plains (altitude 35-45 feet) inset below depositional surfaces of the Chuckatuck Formation (Johnson and Peebles, 1984). Upper part of unit is truncated on the east by the Suffolk and Harpersville scarps; locally, lower part occurs east and west of scarps. Fluvial-estuarine facies comprises (1) a lower pebble to boulder sand overlain by (2) fine to coarse sand interbedded with peat and clayey silt rich in organic material, including in-situ tree stumps and leaves and seeds of cypress, oak, and hickory, which grades upward to (3) medium- to thick-bedded, clayey and sandy silt and silty clay. Marginal-matrix facies in lower James River and lowermost Rappahannock River areas is silty, fine-grained sand and sandy silt containing *Crassostrea virginica*, *Mulinia*, *Noetia*, *Mercenaria*, and other mollusks. *Astrangia* from lower Rappahannock River area has yielded a uranium-series age of $184,000 \pm 20,000$ yrs B.P. (Mixon and others, 1982). Thickness is 0 to 80 feet.

QTW *Quaternary Windsor Formation* (lower Pleistocene or upper Pliocene, Coch, 1968). Gray and yellowish- to reddish-brown sand, gravel, silt, and clay. Constitutes surficial deposits of extensive

plain (altitude 85-95 feet.) seaward of Surry scarp and of coeval, fluvial-estuarine terraces west of scarp. Fining upward sequence beneath plain consists of a basal pebbly sand grading upward into cross-bedded, quartzose sand and massive, clayey silt and silty clay; lower and upper parts of sequence were deposited, respectively, in shallow-marine or open-bay and restricted-bay or lagoonal environments. In terraces west of Surry scarp, fluvial-estuarine deposits comprise muddy, coarse, trough cross-bedded sand and gravel grading upward to sandy silt and clay. Thickness is 0 to 40 feet.

Tc *Tertiary Chesapeake Group* (upper Pliocene to lower Miocene, Darton, 1891). Fine-grained to coarse-grained, quartzose sand, silt, and clay; variably shelly and diatomaceous, deposited mainly in shallow, inner- and middle-shelf waters. Ages of units based on studies of foraminiferal, nannofossil, diatom, and molluscan assemblages in Virginia and adjacent states (Andrews, 1988; Gibson, 1983; Gibson and others, 1980; Poag, 1989; Ward and Blackwelder, 1980; Ward and Krafft, 1984).